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(6) LOCAL LABOR MARKETS AND CYCLIC COMPONENTS IN DEMAND FOR COLLEGE TRAINED MANPOWER.

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LOCAL LABOR MARKETS AND CYCLIC COMPONENTS IN DEMAND FOR COLLEGE TRAINED MANPOWER*

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In this paper we examine earnings of synthetic cohorts contained in the Current Population Surveys (CPS) for each year 1968 to 1975. The CPS data are useful to test for the importance of local labor markets because individuals can be assigned to markets by calendar year and area of residence. We find that contrary to the established conviction, wage rates are sensitive to business cycles. This sensitivity appears, holding industry constant, to be skill neutral so that business cycle movements apparently explain little of the recent time series behavior of relative wages of college graduates. Furthermore, we have identified some important movements in wage rates among areas. These wage differentials seem more sensitive to employment deviations and trends than we at least initially expected.

I. INTRODUCTION

A person's market earnings are determined by skills offered for sale or rent and the prices the market attaches to them. At a point in time if all participate in the same market such that each skill has one price, then the distribution of earnings depends only on the distribution of skills. In fact, the empirical human capital literature has evolved under this one-market assumption as though earnings are determined by skills without particular attention to the way markets determine prices. For cross-sectional data, especially from narrowly defined regions, the one-market assumption is plausible, but is less so for the kinds of panel data now becoming available. In particular, the National Longitudinal and the Income Dynamics Surveys contain observations of individuals dispersed throughout the United States for five or more years. With information of both time and area location, we have the potential of beginning to ask some of the more fundamental questions of earnings determinations.

Because the early human capital-styled earnings analyses were based largely on the 1 in 1000 sample from the 1960 Census which identifies only very broad geographic regions, the one-market assumption has flourished. Consequently we know much more about empirically useful specification of the skill dimensions than we know about specifications of the price or demand side of the earnings determination process. This paper represents our initial foray into the local labor market issue. Our results are tentative, but they suggest that earnings are sensitive to cyclic phenomena and that something can be gained by using area or regional information.

In this paper we examine earnings of synthetic cohorts contained in the Current Population Surveys (CPS) for each year 1968 to 1975.[1] The CPS data are useful for an examination of local labor markets because individuals can be assigned to markets by calendar year and area of residence. The surveys give information of earnings in the year prior to each survey for individuals from between 40,000 and 50,000 nationally representative households. Individual observations either are not replicated or are not identified as repeaters. Nonetheless the Lillard-Willis[2] finding with the first seven years of the Income Dynamics Panel for personal earnings was that in using

an error-components specification both with persistent and first-order Markov individual residuals, point estimates of parameters are very close to what they obtained when the panel was treated as a series of seven independent cross-sections. Therefore we doubt that we are severely handicapped by the serial independence of the CPS data.

As background for the wages of individuals observed over the 1967-1974 period, we have a macro-economy that began as very robust, hit a mini-recession in 1970 and bottomed in 1971, rebounded in 1972 and 1973 and again foundered late in 1974. With this kind of year by year aggregate volatility, it would be surprising if all workers, designated by skill, job experience, geographic location and industry of employment, were similarly affected.

The CPS reports residence for 19 SMSA's and thirty state groups for those not in SMSA's from 1968 to 1972. For the remaining 1973 to 1975 surveys, 35 SMSA's and 23 state groups are identified. Thus persons are identified in a total of 419 markets, partitioned by time and geography. In fact, for short run considerations forced by the year to year nature of these data, it is not clear that there is enough mobility between firms to insure wage equality among similarly skilled workers even within local area markets. Finer partitions of the data, based for example on industry, by locality, by year, could also be considered but we have not explored them in this paper. What is clear is that panel and widely dispersed area data raise questions of local, time dependent labor markets that data like that of the CPS' can begin to confront.

Our analysis is restricted to weekly earnings of college and high school graduates, partitioned on the basis of estimated years of work experience. We concentrate on these groups because the 1967-1974 period witnessed what to many was a long anticipated fall in the relative wages of college graduates. Panel A of Table 1 summarizes relative weekly earnings for selected levels of work experience, and panel B gives similar data for annual earnings. The different behavior of the relative earnings series at alternative work experience levels demonstrates our interest in experience profiles. The changes that have occurred have been largely restricted to new entrants. Although there is evidence of sampling errors, a pattern of rising relative earnings to 1970 or 1971, followed by a decline over the remainder of our period does emerge. This pattern of change is dampened for those with 7-10 years of experience and

vanishes altogether for those with 20-25 years of work experience. Further, the post-1974 decline is more pronounced for weekly than for annual earnings. In fact, with cognizance of sampling variation, it is not clear that the annual earnings pattern of 1967 differs from that of 1974.

Table 1

EARNINGS OF COLLEGE RELATIVE TO HIGH SCHOOL GRADUATES
(Numbers are natural logarithms of ratios of geometric means)

Year in Work Force	Year 1967	1968	1969	1970	1971	1972	1973	1974
				A. Weekly Earnings				
1st	.563	.567	.596	.578	.575	.476	.462	.431
2nd	.478	.504	.523	.522	.513	.454	.438	.422
7th-10th	.378	.361	.352	.361	.361	.353	.347	.331
20th-25th	.399	.351	.394	.403	.391	.395	.352	.392
				B. Annual Earnings				
1st	.593	.637	.698	.708	.665	.576	.497	.525
2nd	.514	.563	.622	.653	.627	.554	.487	.514
7th-10th	.399	.375	.379	.407	.413	.406	.382	.377
20th-25th	.416	.360	.423	.423	.423	.417	.380	.423

The recent downward trend in relative wages of college graduates has been described as a possibly permanent result of changing skill distributions and, consequently, there has been much recent pessimism about the prospects of formal schooling as a route to economic mobility.[3] We feel that the important social and policy issues connected with this recent decline in the relative wage of college graduates makes it a useful focal point for our initial investigation of the role of local and time dependent labor markets. We are in fact less certain that such short-term evidence, restricted as it is to new entrants, is an adequate basis for forecasts for doom. In particular there are confounding effects on the price of skill of business cycles and changing age structures of the work force. We will concentrate here on cycles but include a passing reference to the importance of age structures. This cyclic analysis is our initial foray into "local labor markets" and we are encouraged by preliminary results. Yet there are clearly unanswered problems.

The next section provides background summaries of the age structure of the work force, the macroeconomic setting and its industrial composition for the 1967-1974 time period. We then turn to a regression analysis of earnings of new entrants and conclude with a discussion of some of the ambiguities of our

findings that require us to view what we have as preliminary until more is known about empirically useful specifications of robustness of local labor markets.

II. THE EMPIRICAL SETTING

The age structure of the U.S. work force undergoes a continuing process of change. With secular growth in school completion, it is not surprising that the work force at higher levels of schooling is becoming "young" relative to that at lower levels. The post-World War II baby boom cohorts entered into the labor force, beginning sometime around the mid-1960's, and continued for a decade or so. The higher the level of schooling completed, the later this impact of this baby boom on the new entrant market.

Table 2 demonstrates the general "youthening" of the high school and college graduate work forces occurring over the time span of our data. Both high school and college graduates become "younger" during this period and the pace of change may well have been accelerating. This introduction of large numbers of highly skilled workers at the front end of the labor market is potentially an important cause of the recent decline in the wage of skilled labor. The real question is whether the effects are likely to be permanent or transitory.

We know far too little about substitution relationships across schooling classes or among age groups within schooling levels to do anything more than speculate about effects of an increasingly large and more educated work force arriving at the labor market's port-of-entry. Possibly, for the entering cohort a chronic wage depression results and the effect of the entry bulge persists throughout the career, but perhaps even more likely, the depression is short-lived--a temporary period of adjustment while the market "digests" its new arrivals.

Table 3 provides two kinds of information of general economic indicators. The first, the white male unemployment rate, is a reasonable aggregate summary statistic. It suggests that a recession beginning 1970, bottoming out in 1971 with recovery foundering in 1974. Behind this aggregate trend, Panel B attempts an industrial decomposition. The numbers

Table 2

CUMULATIVE AGE DISTRIBUTIONS OF HIGH SCHOOL AND COLLEGE GRADUATES IN CURRENT POPULATION SURVEYS, ALTERNATE YEARS, 1969-1975[a]

Percent of Those 14-65 Years Old Under Age	Survey Year 1969	1971	1973	1975
A. High School Graduates (schooling = 12 years)				
20	4.4	5.5	7.2	8.0
22	8.8	9.5	12.5	14.4
24	13.8	15.8	18.5	20.2
26	20.0	21.6	25.2	25.7
28	26.7	28.2	30.4	32.5
B. College Graduates (schooling $\geq$ 16 years)				
24	4.0	5.6	5.4	5.8
26	10.4	11.0	12.2	12.7
28	17.0	18.0	18.9	21.3
30	23.9	24.7	27.1	28.5
32	29.7	30.7	34.0	36.9

[a]Ages are as reported in March of indicated year. Recall that earnings for these people refer to the previous year. Even numbered years are deleted because patterns are redundant.

reported are residuals from regressions over the 1947-74 period of (the log, base e, of) national aggregate employment within each industry on a quadratic in time. Hoepfully, these deviations measure percentage departures from trend.

We are not sure that this kind of deviation measure is a "good" index of levels of labor demand within industry. We are encouraged by the congruence of this measure for manufacturing durables and aggregate unemployment rates. But, the diversity among industries is surprising. In any case, these numbers tell an interesting story for contrasts of college and high school graduates.

Table 4 reports average industry-of-employment distributions for new entrants who are not employed in agriculture or public administration. The work experience definition we have used refers to a probability density of over years in the labor force conditional on age, schooling and year of birth.[4] It improves on the standard (age - schooling - 6) definitions of experience in a number of wages. First, since it is conditional on cohort of birth, it allows for the strong cohort effects with more recent cohorts finishing a given level of schooling at earlier ages. Second, by conditioning on age, it provides a more accurate measure of experience for younger workers. The

Table 3

MEASURES OF LEVELS OF ECONOMIC ACTIVITIES: THE WHITE MALE UNEMPLOYMENT RATE AND DEVIATIONS FROM EMPLOYMENT TRENDS BY ONE-DIGIT INDUSTRY, 1967-1974

	Year							
	1967	1968	1969	1970	1971	1972	1973	1974
A. Annual Average Unemployment Rate, White Males (Percent)								
	2.7	2.6	2.5	4.0	4.9	4.5	3.7	4.3
B. Percentage Deviation from U.S. Aggregate Employment Trend[a]								
Industry								
Mining	-3.2	-3.7	-1.2	-0.2	-2.8	-0.5	-0.2	10.0
Construction								
Manufacturing	-4.6	-4.2	0.5	-1.2	-0.3	2.8	5.6	2.1
Durables	6.4	6.8	7.8	0.4	-6.6	-4.9	0.5	1.4
Non-Durables	2.7	3.7	4.2	1.8	-1.5	-1.5	-0.8	-2.4
Transportation, Communication and Utilities	1.0	1.0	2.5	2.5	-0.0	-0.4	0.4	0.4
Wholesale and Retail Trade	0.6	1.2	2.1	0.9	-0.8	-0.5	-0.1	0.8
Finance, Insurance and Real Estate	-2.6	-1.1	0.9	1.1	0.8	0.9	0.8	1.3
Services	1.7	2.4	3.4	2.2	-0.4	-1.6	-2.1	-1.4

[a]These are residuals (x 100.0) from regressions of the form $\ln E_{it} = a+bt+ct^2+u$ where E_{it} is U.S. Aggregate Employment in industry, i, year, t. Observations are annual for the 1947-74 period.

expected entry age for an individual who is working is truncated at his current age. This not only avoids the minor embarrassment of negative inputed experience for large numbers of young people using the standard definition of experience, but also provides a more reliable measure for those who are currently observed working. Using these densities, we computed the probability that an individual observed was in his first eight years on the job. Alongside this probability, we drew a uniform random number distributed over the unit interval and if the number drawn is less than the probability that the person observed is in his first eight years, he is defined as a new entrant and retained in the sample. Otherwise, he is excluded.

Table 4

INDUSTRIAL DISTRIBUTIONS OF EMPLOYMENT AND ANNUAL AVERAGE PERCENTAGE DEVIATIONS FROM INDUSTRY-OF-EMPLOYMENT TREND FOR "NEW ENTRANT" HIGH SCHOOL AND COLLEGE GRADUATES 1967-1974[a]

	High School Graduates	College Graduates
A. Industry of Employment[b]		
Mining	1.4	0.9
Construction Manufacturing	12.0	3.7
Durables	26.1	15.0
Non-Durables	12.9	9.2
Transportation, Communication and Utilities	9.5	4.7
Wholesale and Retail Trade	24.2	13.5
Finance, Insurance & Real Estate	3.1	9.9
Services	10.6	43.0
B. Percentage Deviation from Trend (by Year)[c]		
1967	1.8	1.7
1968	2.3	2.3
1969	3.8	3.5
1970	0.9	1.5
1971	-2.2	-1.4
1972	-1.5	-1.4
1973	0.5	-0.6
1974	0.6	-0.2

[a] "New Entrants" refers to those estimated to have eight years or less of work experience.

[b] 1967-74 average distributions.

[c] Weighted averages using industry-of-employment weights and residuals reported in Table 3.

The differences in industry employment distributions between high school and college graduates is astonishing. High school graduates inhabit the traditionally more cyclic sensitive industries while a surprising 43 percent of all college graduates are employed in services--largely professional services--not commonly noted for their cyclic vulnerability. In fact, the employment distributions of these groups are so different that we wonder whether the evidence of counter-cyclic covariance between schooling and employment may not be more of a compositional artifact instead of the popular views of "skill specificity" or relative complimentarity of skilled labor with fixed capital. The second panel of Table 4 reports averages across industries of the deviations from trend described in Table 3 weighted each year, respectively, by employment densities for new entrant high school and college graduates. They indeed show more year-to-year variance for high school graduates but toward the period's end, they also suggest that industries inhabited by college graduates were depressed relative to those employing high school grads.

III. BUSINESS CYCLES AND RETURNS TO SCHOOLING: WHAT DOES THEORY PREDICT?

Existing theories of the skill composition of cyclic related labor demand are exclusively theories of firm behavior. We are aware of no distinctions associated with differing skill mixes across industries alongside industrial differences in timing and degree of vulnerability to fluctuations in aggregate demand. At a theoretical level these compositional effects are transparent and warrant little discussion, but at an empirical level--if the distributions reported in Table 4 are indicative--they can swamp differences within firms altogether.

There are two popular theories of firm behavior which for most cases are treated as observational equivalents. The first is that substitution elasticities between (short-run) fixed capital and "unskilled" labor exceed those between "skilled" labor and capital. Accordingly as product demand decays, in the short-run firms will compensate for capital fixity by relying more heavily on reduced quantities of those inputs that

substitute best for capital. If substitution relationships are as posited, then the demand for unskilled labor falls relative to the demand for skilled labor.

The competitive theory is that of skill specificity. The notion is first that firms invest (through hiring, training costs, etc.) in its workers and protects these investments as demand falls by reducing utilization rates rather than by terminating employment altogether. The skill composition part of this theory is gained by positing that the firm's specific investment share of labor's products is positively correlated with skill level. Thus, the firm protects its skilled work force relative to the unskilled group under temporary downturns.

The similarities between many predictions of these views are obvious, but they may differ most significantly in their predictions for interactions between age or experience profiles and the skill composition of demand. Nothing in the relative substitutability argument distinguishes workers of given skill across experience levels. An insider is no different from an outsider and transaction costs are irrelevant. Aside from the minor embarrassment that skill varies with experience, the relative substitutability argument would posit experience neutral relative demand effects. Not so for the specific investment view.

To it, the distinction between insiders and outsiders is crucial. An outsider is someone in whom hiring and training costs are not vested; an insider is fully vested, and recent hires are a mixture if the training period is not instantaneous. To pursue the firm-specific view, suppose a firm experiences a temporary reduction in product demand and reacts by firing some of those with nil transaction costs, laying off some of those who regardless of firm investments have the highest probabilities of successful recall (those for whom continued employment carries rents, such as union workers and skilled labor with large specific investments who have "shared" these investment costs with the firm), and reducing hours worked on whatever to hedge against loss of those, presumably with large firm-specific investments, whose continued employment conveys the prospect of future rents. Now if firm-specificity is positively correlated with skill level, during a recession the members of a firm's maintained work force who are most underutilized will be the most skilled. But, in the dynamics of a labor market new entrants arrive continuously. What is the plight of a highly skilled new entrant (an outsider to all but "family" firms) who

when hired and trained will become a perfect substitute for those who are already in excess supply?

It is easy to envision a firm-specific theory in which the forces that tend to stabilize demand for the experienced (implicitly "tenured") work force are exactly the same as those that destabilize demand for new entrants. Such a view would predict procyclic motion in income returns to schooling for new entrants relative to the experienced work force.

This, of course, is an over-simplification because firms with long-run plans may not admit new entrants only as the vagaries of the cycle dictate. Seniority structures may be important. But even if hiring policies depend only on (long run) trend; that is, if seniority profiles are totally dominant, so long as the training period is prolonged, it must be that firms capitalize on the underutilization of their experienced work forces to accelerate training for new hires during recessions. Further, if training costs are shared between firm and worker, then predictions for cyclic swings in returns to schooling are unchanged. This, of course, says nothing about whether returns to schooling actually fall for new entrants as recessions occur. It is only that the rationale for counter-cycle motion is not nearly as convincing for new entrants as it is for the experienced work force.

IV. WAGES AND CYCLES: A TENTATIVE FORAY INTO THE NEW ENTRANT MARKET

How do you measure a business cycle? In particular, if you are concerned with geographic diversity, with observing cycles in the cross-section to expand the observation set over simple time series observations, to what data do you turn? Clearly, unemployment rates will not do for there are persistent geographic differentials which are positively correlated with wages.

Our approach is very simple and we have no real confidence that it is the best among numerous alternatives. We measure cycles as employment deviations from trend. We have data by state of estimated total employment by one-digit industry for the 1947-74 period. We have no corresponding data for SMSA's so SMSA residents are simply placed in their appropriate "state."

Given the 30 state groups for the first five surveys and the 23 groups for the last three years of our data, there are a total of 40 distinct groupings that appear in at least one of the two alternative state arrangements.

Excepting agriculture and public administration, we ran time series regressions within each of these 40 areas of the form

$$(1) \qquad \ln E_{ijt} = a_{ij} + b_{ij}t + c_{ij}t^2 + u_{ijt}$$

where E refers to total annual employment, the subscript, i, indicates area; j refers to one-digit industry and t indicates calendar year. Calculated residuals from these 320 (8 industries and 40 areas) regressions are our indexes of industry x area x time specific deviations from trend which we take as our index of "the level of labor demand." Because of the likelihood that these measures are excessively noisy we next created instrumental variables for these residuals via second-stage auxiliary regressions. To do this, we calculated regressions similar to those for the area x industry specific observations for U.S. aggregate employment by industry on a quadratic trend factor and then calculated similar area specific regressions using aggregate employment by area. Finally, we regressed the industry x area residuals on both the aggregate industry and aggregate area residuals within each of the 320 industry by area specifications. Predicted values from these auxiliary regressions are our instrumental indicators of cycles.

It is likely that business cycle effects on wages and labor utilization rates are most severe for new entrants. Because of this, we have concentrated on interactions between work experience or time in the labor market and our labor-demand indicators. But the CPS like other "Census-styled" data contains no direct information of work experience. Our approach is to infer experience from age and schooling but instead of using a single measure as is typically done, such as the expected number of years at work, we use a full distribution of years at work. These distributions, conditional on age and schooling, are reported in Table 7 (appended). New entrants to which the sample is restricted are those in their first eight years of work experience. After initially screening the samples for workers, the probability of including an observation in our new entrant sample is the probability (inferred from Table 7) that he is in his first eight years.[5]

One of our more interesting results for wage-experience profiles is that in comparison to the now common treatment of wages as a simple quadratic function of market experience, alternative descriptions are more powerful. For example, among high school graduates we find that two variables, the probability that a worker is in his first year along with the probability that he is in his fifth year at work, dominate the more common experience and experience-squared variables in describing wage paths of new entrants. In fact, squared partial correlations between (ln) weekly earnings and the year 1 and year 5 probabilities holding (expected) experience and experience-squared constant exceed the alternative squared partials for experience and experience-squared by a multiple from 9.5 to 24.7 over the eight surveys.[6] Thus we opt for career wage profiles as described by the year 1 and year 5 probabilities. Estimated profiles can be inferred from parameter estimates in conjunction with probabilities summarized in Table 7.

To characterize the effects of business cycles on earnings we used linear interactions with work experience of the form

$$(2) \qquad \text{dev} \times \sum_{j=1}^{8} \{(9-j)/8\}P_j$$

where "dev" is the instrumental variable for industry x time x area employment deviation and P_j is the probability (from Table 7) that a worker is in his j-th year of work. Therefore, the estimated effect on personal earnings caused by aggregate employment departures from trend is constrained to decline linearly over the first eight years on the job and is fixed at zero thereafter.

V. SUMMARY OF REGRESSION RESULTS

Table 5 contains our main results for weekly earnings determination. Most coefficients are scaled to be read as percentages (subject to the log approximation). For example, the coefficient for residence in the North Central Region suggests weekly earnings 5.1 percent above the Northeast reference region. The reference group, the group whose wage is predicted by the intercept, refers to Northeastern residents who do not live in an SMSA (or a central city), and who have

Table 5

REGRESSION ESTIMATES OF FACTORS AFFECTING WEEKLY EARNINGS FOR NEW ENTRANT HIGH SCHOOL AND COLLEGE GRADUATES, 1967-1974
(The dependent variable is the logarithm, base e, of nominal weekly earnings

Variable	Part Time Variable Omitted		Part Time Variable Included	
	Coefficient	t-statistic	Coefficient	t-statistic
Part Time	--	--	-68.60	57.82
1. Regional Variables				
a. Resides in:				
1) North Central	5.10	5.01	6.05	6.29
2) South	-3.48	2.33	-2.59	1.84
3) West	-3.68	2.60	-0.73	0.55
b. Resides in:				
1) SMSA	12.05	16.39	12.62	18.19
2) Central City	-7.95	10.69	-7.28	10.36
2. Time and Area Characteristics				
a. Area x Industry Employment Deviation from Trend[a]	1.20	5.87	0.88	4.59
b. (2.a) x College Grad	0.07	0.14	0.20	0.44
c. Survey Year	6.04	14.07	5.94	14.66
d. "Trend" Rate of Growth in Total Area Employment	4.97	5.04	2.79	2.99
e. (2.c) x Trend in Annual Rate of Growth in Total Employment in Area	-0.14	1.07	-0.17	1.41
f. (2.d) x Years of Work Experience	-0.25	3.38	0.15	2.11

Table 5 (cont'd)

Variable	Part Time Variable Omitted Coefficient	Omitted t-statistic	Included Coefficient	Included t-statistic
g. 1962-74 Average Annual Unemployment Rate in Area	1.65	2.67	1.70	2.91
h. Fraction of Area Labor Force Unionized	52.66	7.39	44.43	6.61
3. Work Experience				
a. Year 1 Probability	-2.17	48.86	-1.51	34.71
b. Year 3 Probability	-1.14	13.53	-0.79	9.92
4. College Graduate				
a. 1967	34.12	10.27	32.28	10.29
1968	33.02	10.23	32.83	10.77
1969	36.39	10.62	34.34	10.61
1970	38.89	12.82	37.04	12.93
1971	33.85	11.94	31.39	11.73
1972	30.35	10.32	29.31	10.56
1973	27.74	10.20	26.48	10.31
1974	26.46	9.66	24.45	9.45
b. More than 16 years of Schooling	2.19	1.93	3.05	2.84
5. Years of Work Experience x College Graduation				
1967	0.13	0.23	0.23	0.43
1968	0.34	0.60	0.30	0.57
1969	0.29	0.48	0.53	0.95
1970	0.09	0.15	0.31	0.58
1971	0.18	0.34	0.55	1.11
1972	0.25	0.44	0.43	0.81
1973	0.57	1.07	0.85	1.71
1974	0.57	1.11	1.02	2.10
6. Intercept	4.60	98.94	4.56	103.70

Table 5 (cont'd)

Summary Statistics		
Number of Observations	27,428	27,428
Variance of Estimate	1.247	0.220
R^2	0.367	0.436

[a]Predicted deviations from trend

twelve years of schooling. Survey year is measured as 1 to 8 and the implication of the first regression is that nominal weekly earnings were rising at an average annual rate of 6.04 percent.

Two regressions are reported. In the first, no provision for part-time work is included but it is in the second. Presumably the second refers more closely to wage rates and hours worked per week.

Without control for part-time status we find that the area x industry employment residual is a "significant" predictor of weekly earnings and the estimated coefficient suggests that a one percent positive deviation from trend increases weekly earnings by 1.2 percent for persons in their first year on the job. This effect is constrained to fall linearly to zero by the ninth year. Variable 2.6 permits this effect to differ between high school and college graduates but there is no evidence that it does. The evidence here is on neutrality, within area and industry, between high school and college grads, at least for new entrants. This says nothing of aggregate neutrality because of school related differences in the industrial structure of employment.

The evidence of neutrality of cyclic impact between high school and college graduate new entrants is contrary to what we expect for the "experienced" part of employment structures. There, a variety of evidence has shown countercyclic motion in college/high school graduate wage ratios. Yet, if the neutrality finding for new entrants is correct, then it does nothing to explain the recent decay in relative earnings of college graduates. Nor, of course, does it help to explain the apparent rise in relative earnings during the first years of our data.

Variable 2.d measures the trend rate of total employment growth within area and our result is that wages are higher in more "robust" areas. This result refers to differences within broad geographic regions since persistent differentials are held constant in variables 1.a and 1.b. We had no *a priori* expectation concerning this effect because we have not addressed the question of why employment in one area rises relative to that of another. We did expect that if real (i.e., area cost-of-living adjusted) wages are negatively correlated with area employment growth, then the employment growth rate and time would interact positively because sustained growth would pull

wages upward. This, of course, says that our view of growth would be that it is demand driven. Were it driven by labor supply, we would expect the opposite interaction. If there is evidence here it is of negative interaction. Since we find positive direct effects of growth, this is as it should be. Whatever is generating area shifts in employment patterns is tending toward the elimination of wage differentials across areas.

The next variable, years of work experience interacted with the local area growth rate, represents our attempt to see how more rapid growth affects the wage distribution among experience groups. That this effect switches from "significantly" negative to "significantly" positive as control for part-time work is introduced suggests that the probability that a new entrant will be employed only part-time is inverse to the trend rate of growth in area employment.

In the equation which controls for part-time status, area wage differences appear smaller for new entrants than for the experienced work force. If migration is driving these differentials away, it is not surprising that the most mobile group, the recent graduates, are leading indicators.

The fact that regional differentials noted in coefficient estimates for variables 1 are smaller than those found in earlier studies, together with the evidence of convergence between areas over the eight years of data, is important. There has been a tendency in empirical research to treat spacial differentials as persistent and as reflecting equalizing differentials of costs-of-living broadly defined to take notions of generalized amenities into account.[7] Yet, since these differentials are changing, more work should be devoted to trying to understand their dynamic patterns. Possibly, we have been too quick in assuming that spacial differences reflect markets in long run equilibrium.

Variable 2.g refers to averages within states of unemployment rates for a 13 year period. Persistent unemployment differences across states present a problem worthy of further research. These levels are clearly positively correlated with earnings and the high intertemporal correlations between them suggests that unemployment rates are not useful descriptions of cycles in the cross-section.[8] They may be simply artifacts of industrial mix and of seasonality. We do know that spacial differentials in unemployment are persistent and that they are

correlated with weekly earnings. Interestingly, in regressions (not reported here) like those of Table 5 where the dependent variable is annual earnings instead of weekly wages, no corresponding correlation with state unemployment rates is found. Apparently, persistent unemployment differentials reflect persistent differentials in weeks worked that are fully compensated in annual earnings.

Unionism, not available for individual observations but available for state aggregates, has a marked effect on earnings. In states where, say, 15 percent of the work force is unionized average weekly earnings are four to five percent lower than in states where 25 percent of the work force is unionized. These differences are somewhat smaller for annual earnings comparisons suggesting that persons in states with more unionism work fewer weeks than others in less heavily unionized states.

VI. WHAT WE HAVE LEARNED

We focused in this paper on what from the vantage of hindsight appears to be two quite complex questions: (1) of simulating business cycles in the cross-section, and (2) of determining their effects on relative earnings of new entrant college graduates. On the second issue, we found no evidence of non-neutralities of local industrial cycles, as we have measured them, between college and high school graduates who have recently entered the job market. If cyclic effects are in fact neutral for new entrants, then they contrast sharply with what has been suggested for more experienced workers where effects on returns to higher education are commonly presumed to be countercyclic.[9] Our findings are consistent with our earlier theoretical discussion. We argued that in analyzing the effects of cycles on wage differentials by skill level, it was important to distinguish between new entrants and the more experienced part of the work force. Our theory suggested that the countercyclical pattern of skilled wage differentials should be less pronounced for new entrants. Our evidence of neutrality for new entrants combined with the well-documented countercyclic relative wages of highly skilled

workers with more labor market experience is consistent with our theoretical expectations.

Table 6 summarizes estimated college/high school wage ratios taken from the regression described in Table 8 (appended) when the part-time variable is included. As in Table 1, most of the action is among new entrants, returns to higher education first rise then fall over the period and college/high school graduate wage ratios are lower for new entrants by the end of the period than at its beginning. We have augmented Table 6 with college/high school ratios of new entrant observations for each of our survey years.

Clearly our mascinations with cyclic related variables does little to eliminate this trend. It is more muted at the extremes in our estimate than the simple averages for persons in their first year (reported in Table 1) suggest, but little else can be said. Does this admit to a depression for earnings of college graduates? We think not, but it does shift emphasis away from business cycles to questions of effects of cohort size on career earning profiles. Until information can be presented showing effects of cohort size on earnings profiles, we will remain ignorant about whether depressed new entrant earnings during 1972-74 will persist for these cohorts and whether effects will spill over to post-1974 cohorts. However, the simple ratios of college to high school graduates in Table 6 suggests that relative size of cohorts may be a more powerful explanation for the relative earnings of new entrants. If the size of cohort produces only a temporary decline until the market absorbs the new workers, it remains plausible that this recent "depression" is only "market indigestion."

If our deviations are adequate proxies, our results do indicate that wages are flexible to short run cycles. This contrasts sharply with the standard assumption of short run wage inflexibility with employment bearing the brunt of short run adjustments. It is our opinion that economists have proceeded too long under the assumption that wages are invariant to the cyclic vagaries. We trust that our results will reopen this question to additional empirical investigation.

Turning to the first question, the fundamental issue is whether we have measured cycles correctly in the cross-sections. The measure we use is something of a tautology: trend is trend, and cycles are departures from trend. If labor demand fluctuates over business cycles and if wages are

Table 6

IMPLIED (ln) COLLEGE/HIGH SCHOOL GRADUATE WAGE RATIOS FOR NEW ENTRANTS AND RATIO OF NEW ENTRANT COLLEGE TO HIGH SCHOOL GRADUATE COHORTS

Calendar Year	Years of Work Experience 0	8	New Entrant College Graduates As A Percent of New Entrant High School Graduates
1967	.388	.401	45.8
1968	.404	.415	46.9
1969	.418	.456	45.4
1970	.442	.465	45.3
1971	.380	.419	47.1
1972	.354	.397	45.8
1973	.332	.406	50.4
1974	.308	.398	51.7

not perfectly flexible so that shocks in demand generate changes in employment, then presumably our employment departures from trend reflect demand shocks.

Our deviation measures are a composite of effects over time and geographic space. We have a preference for simpler alternatives than ours for measuring aggregate demand fluctuations over time. Yet conventional measures like unemployment rates which may be reasonable for changes over time carry difficult cross-sectional interpretations. Moreover, since most panel data sets contain less than 10 years of observations, little can be learned about the impact of cycles unless the number of observations can be expanded. To this end, we have raised the question of whether we can simulate business cycles in the cross-section. If differences among local labor markets generate differences similar to what one finds for variations in the national economy about its trend, then our potential for learning about cyclic behavior is greatly expanded.

There are a number of things to be expected of a variable such as ours which purports to measure short-run changes in labor demand both among local labor markets and through time. First, in some sense it should perform better in the eight pooled cross-sections of data than a simple time-specific aggregate (i.e., area invariant) measure like the unemployment rate. Second, if it in fact measures cycles in the cross-section, results should be maintained under separation of the pooled cross-sections into individual cross-sections. On the first criteria, we do reasonably well. Using the same

specification for other variables, we re-estimated the regression substituting the U.S. aggregate adult male unemployment rate for our deviation measure. When our part-time work variable was omitted the effects of unemployment were to increase weekly earnings! When the part-time variable is included, the effect is reversed: wages fall as the unemployment rate rises. Further, even with inclusion of the part-time variable--when the unemployment rate has the right sign--it is not as highly correlated with wages as our deviations.

Using the second criteria, our deviation measures produced mixed results. We clearly outperformed similar area disaggregation of the unemployment rate which was positively related to wages. In partitioning our sample into its eight component cross-sections we found an interesting pattern for coefficients estimated on the employment deviation measure. For 1967 through 1970, the area x industry effect on wages was (strongly) positive and coefficients were reasonably stable. But in 1971, the worst year vis-a-vis general economic conditions, the effect switched to (significantly) negative. This reversal holds for 1972 but the estimate is statistically insignificant and then returns to positive in 1973 and 1974. Perhaps we should be content with a consistent result in six of eight years along with an ambiguous finding in one of the remaining two, but the macro-cyclical pattern of our individual year estimates is intriguing[10] and suggests a potential reason for our negative results in two years.

To illustrate, consider an industrial partition. Some industries are more volatile than others. Suppose that in good years conditions in volatile industries are <u>very</u> good and in bad years conditions in these industries are <u>very</u> bad. Positive effects on earnings for the industry deviation measure in good years may only point to the fact that earnings in volatile industries are higher than in industries where employment is more secure. If so, then in bad years, the largest negative residuals would be associated with the most vulnerable industries and if earnings are higher there, the coefficient on the deviation measure would be negative in bad years. This is pretty much what we observe.

Since the theory of compensating differentials predicts higher wages where employment is less secure, it seems that we should have controlled for inherent employment instability among industries. While several measures suggest themselves

we opted for the simplest: namely, we added dummy variables for each one-digit industry.

The finding as reported in Table 8 (appended) is what one would expect. Relative to non-durable manufacturing, wages are significantly higher in the more cyclically vulnerable mining, construction and durable manufacturing industries and are lower in more stable industries such as trade (both retail and wholesale) and especially in service industries.[11] Interestingly, the inclusion of industry dummy variables reduced the estimated wage effects for the cyclic deviation measure, as would be expected, but did not eliminate it altogether. In fact, in cross-sectional regressions, when dummies for industry are included the estimated employment deviation effect is positive in seven of eight years and in 1971, the original outlier, the estimated coefficient is reduced to a (statistically) trivial negative effect. For the pooled cross-sections the estimated coefficient on the area x industry employment deviation measure is:

Part-Time Dummy	
Omitted	Included
0.61	0.46
(3.02)	(2.41)

where the numbers in parentheses are t-statistics. It is too early to evaluate the ultimate potential in using cross-sectional information to augment the cyclic trends observed in time series. Empirical investigation on this issue is in its preliminary stage and we did not expect our first attempt to resolve the issue. Much additional research by ourselves and others is required before we know whether we are pursuing a dead end or opening up a fertile new field of research.

VII. CONCLUSION

We have clearly only scratched the surface of the research on the importance of local labor markets. We recognize that our proxy for cycles is only one of many that should be explored. It has the potential advantage of measuring cycles in the cross-section as well as through time and results for the earnings analysis are generally encouraging. We found that

contrary to the established conviction, wage rates are sensitive to business cycles. This sensitivity appears, holding industry constant, to be skill neutral so that business cycle movements apparently explain little of the recent time series behavior of relative wages of college graduates. Furthermore, we have identified some important movements in wage rates among areas. These wage differentials seem more sensitive to employment deviations and trends than we at least initially expected. Finally, in the current use of panel data, coefficients of the deterministic earnings components have often been assumed to be constant over time. If panel data are to be exploited for the information they contribute to earnings dynamics, it should be that coefficients constrained vis-a-vis equality through time should withstand tests of cross-sectional decomposition. Our results suggest too much time related motion in earnings parameters for this problem to be ignored.

APPENDIX

Table 7

ESTIMATED AVERAGE EXPERIENCE PROFILES BY AGE, 1967-74

Age	Probability that individual is in his year at work: 1st	2nd	3rd	4th	5th	6th	7th	8th	Probability of Inclusion As New Entrant
	A. High School Graduates[a]								
17	.592	.276	.098	.029	.005	--	--	--	1.000
18	.535	.275	.128	.046	.014	.002	--	--	1.000
19	.458	.287	.151	.071	.025	.007	.001	--	1.000
20	.359	.290	.186	.097	.046	.016	.005	.001	1.000
21	.244	.259	.220	.146	.077	.036	.013	.004	.999
22	.153	.201	.217	.189	.127	.067	.031	.011	.996
23	.086	.136	.181	.198	.174	.119	.062	.029	.985
24	.045	.083	.129	.173	.189	.166	.113	.060	.958
25	.017	.044	.082	.127	.169	.186	.164	.112	.900
26	.005	.017	.043	.080	.125	.168	.185	.164	.787
27	.003	.007	.018	.043	.080	.124	.166	.183	.624
28	.002	.004	.009	.020	.004	.079	.123	.165	.444
29	.001	.002	.004	.010	.021	.044	.079	.122	.284
30	.001	.002	.003	.005	.011	.021	.043	.077	.164

Table 7 (cont'd)

Age	Probability that individual is in his year at work: 1st	2nd	3rd	4th	5th	6th	7th	8th	Probability of Inclusion As New Entrant
				B. College Graduates[b]					
21	.325	.213	185	128	.070	.029	.008	.002	1.000
22	.509	.182	103	090	.062	.034	.014	.004	.999
23	.407	.298	112	062	.053	.037	.021	.008	.997
24	.290	.285	210	082	.044	.038	.027	.015	.992
25	.210	.228	224	166	066	.036	.030	.021	.981
26	.143	.180	195	191	142	.058	.031	.026	.966
27	.092	.132	163	176	172	.128	.053	.028	.944
28	.053	.090	126	155	165	.160	.119	.050	.920
29	.032	.056	090	123	150	.158	.152	.113	.873
30	.017	.033	056	089	122	.147	.155	.148	.766
31	.009	.018	034	056	089	.121	.145	.152	.624
32	.005	.011	021	037	059	.090	.120	.142	.485
33	.004	.007	013	023	040	.062	.092	.119	.358
34	.004	.005	008	015	026	.043	.065	.094	.260
35	.003	.004	006	009	016	.028	.045	.066	.177

[a]In the eight surveys there are 4 persons in our sample who are 15 or 16 years old and report being high school graduates. Their inputed experience profiles are not reported.

[b]There are 5 persons in our sample who are 19 or 20 years old and report being college graduates. Their inputed experience profiles are not reported.

Table 8

REGRESSION ESTIMATES OF FACTORS AFFECTING WEEKLY EARNINGS FOR NEW ENTRANT HIGH SCHOOL AND COLLEGE GRADUATES, 1967-1974
(The dependent variable is the logarithm, base e, of nominal weekly earnings)

Variable	Part Time Variable Omitted Coefficient	Part Time Variable Omitted t-statistic	Part Time Variable Included Coefficient	Part Time Variable Included t-statistic
Part Time	--	--	-63.89	53.95
1. Regional Variables				
a. Resides in:				
1) North Central	4.09	4.09	5.32	5.90
2) South	-4.05	2.77	-3.08	2.22
3) West	-3.22	2.32	- .62	.47
b. Resides in:				
1) SMSA	12.10	16.72	12.54	18.22
2) Central City	-6.61	9.05	-6.27	9.04
2. Time and Area Characteristics				
a. Area x Industry Employment Deviation from Trend[a]	.61	3.02	.46	2.41
b. (2.a) x College Grad	- .16	.32	- .05	.10
c. Survey Year	5.95	14.14	5.86	14.63
d. "Trend" Rate of Growth in Total Area Employment	4.53	4.68	2.59	2.81
e. (2.c) x Trend in Annual Rate of Growth in Total Employment in Area	- .13	1.01	- .16	1.31
f. (2.d) x Years of Work Experience	- .18	2.53	.02	2.45

[a] Predicted deviation from trend

Table 8 (cont'd)

Variable	Part Time Variable Omitted Coefficient	Omitted t-statistic	Included Coefficient	Included t-statistic
g. 1962-74 Average Annual Unemployment Rate in Area	1.33	2.19	1.50	2.60
h. Fraction of Area Labor Force Unionized	49.80	7.14	43.10	6.50
3. Work Experience				
a. Year 1 Probability	-2.02	46.23	-1.45	33.65
b. Year 2 Probability	-1.09	13.25	- .78	9.95
4. College Graduate				
a. 1967	40.56	10.80	38.85	10.88
1968	40.68	11.05	40.36	11.53
1969	43.89	11.48	41.82	11.51
1970	45.97	13.13	44.19	13.27
1971	40.19	11.97	37.99	11.90
1972	36.15	10.47	35.40	10.79
1973	34.25	10.45	33.18	10.65
1974	32.47	9.85	30.80	9.82
b. More than 16 Years of Schooling	7.08	6.08	7.06	6.37
5. Years of Work Experience x College Graduation				
1967	.08	.14	.15	.29
1968	.18	.32	.14	.27
1969	.26	.45	.47	.85
1970	.10	.18	.29	.54
1971	.16	.31	.48	.99
1972	.43	.77	.54	1.01
1973	.71	1.36	.92	1.87
1974	.78	1.56	1.13	2.36
6. Intercept	4.64	99.89	4.58	103.62

Table 8 (cont'd)

Variable	Part Time Variable Omitted Coefficient	Omitted t-statistic	Included Coefficient	Included t-statistic
7. Industry (Relative to Non-Durable Manufacturing)				
a. Mining	17.51	5.43	15.79	5.15
b. Construction	5.75	4.01	5.70	4.18
c. Durable Manufacturing	4.52	3.71	3.34	2.89
d. Transportation, Communication and Utilities	6.27	4.10	6.90	4.75
e. Wholesale and Retail Trade	-13.65	11.00	-9.08	7.66
f. Finance, Insurance & Real Estate	-1.36	.60	.15	.07
g. Services	-22.80	15.36	-16.59	11.72
8. College x Industry (Relative to Non-Durable Manufacturing)				
a. Mining	-8.52	1.29	-7.67	1.22
b. Construction	-15.31	4.37	-14.64	4.39
c. Durable Manufacturing	.61	.25	1.37	.58
d. Transportation, Communication and Utilities	-8.53	2.58	-8.11	2.58
e. Wholesale and Retail Trade	- .16	.06	-1.82	.75
f. Finance, Insurance & Real Estate	-2.93	.90	-4.68	1.50
g. Services	.84	.35	-1.79	.78
Summary Statistics				
Number of Observations	27,428		27,428	
Variance of Estimate	0.236		.214	
R^2	0.394		0.452	

FOOTNOTES

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[1]The data refer to white males described in the March survey of each year. These are Census-styled data containing in addition to the ordinary information of residence, age, schooling, industry, occupation, etc., only information from last year's labor income and the number of weeks worked. Since income refers to the previous year, we will index these surveys as 1967-74 noting only that the data for each earning year are taken from a survey conducted in March of the ensuing year. Samples are restricted to persons with exactly twelve years of schooling or with sixteen or more years. Also excluded are persons under 14 or over 65 years old; those self-employed or working without pay; retired or in armed forces; major activity last week was school; part-year workers (worked less than 50 weeks) if reason for part-year work was school enrollment; and/or, finally those with reported wages of less than $10.

[2]See Lee Lillard and Robert Willis.

[3]See Richard Freeman.

[4]These distributions were derived by contrasts of the 1940, 1950, 1960, and 1970 U.S. Censuses showing school completion as a function of age. See Welch and Gould.

[5]This implicit weighting of the sample is a hedge against functional mis-specification, a luxury afforded by samples as large as these.

[6]The early career earnings profile seems to have a first derivative that declines much more rapidly than is implied by the linear derivative of the quadratic specification.

[7]For an attempt to price the attributes of local area labor markets, see Sherwin Rosen.

[8]For an examination of unemployment rates across areas, see Robert Hall.

[9]Notice that the evidence reported here refers to neutrality within industries. To the extent that college graduates are disproportionately employed in industries that are less vulnerable, the aggregate effect on relative earnings of college graduates is countercyclical. But this results from composition, not from firms hoarding of highly skilled workers during recessions.

[10]An additional test of our cyclic measures recognizes that labor utilization rates (weeks worked) are presumably more sensitive to cycles than wages. Our measures should

predict wage fluctuations as well as utilization rates. Our preliminary exploration on utilization rates produced erratic, after negative but certainly mixed, results. The results depended a great deal on the utilization method employed. We plan to explore this problem further in future work.

[11] Note that the regressions used in Table 6 to calculate relative earnings of college to high school graduates were based on these regressions with industry dummies included.

REFERENCES

Freeman, R., "The Declining Economic Value of Higher Education," A Harvard Institute of Economic Research Discussion Paper, No. 421, Cambridge, Massachusetts, 1975.

Hall, R. E., "The Rigidity of Wages and the Persistence of Unemployment," Brookings Papers in Economic Activity, No. 2, 1975.

Lillard, L. and R. Willis, "Dynamic Aspects of Earnings Mobility," Econometrica (forthcoming)

Rosen, S., "Wage Based Indices on Urban Quality of Life," Issues in Urban Economics, Vol. 2 (forthcoming)

Welch, F. and W. Gould, "An Experience Imputation or an Imputation Experience," Rand Mimeo, 1976 (unpublished.)